

OXFORD

INTERNATIONAL
AQA EXAMINATIONS

INTERNATIONAL AS BIOLOGY

9610

BL02 Biological systems and disease

Mark scheme

January 2019

Version: 1.0 Final



1 9 1 X B L 0 2 / M S

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from oxfordaqaexams.org.uk

Level of response marking instructions

Level of response mark schemes are broken down into levels, each of which has a descriptor. The descriptor for the level shows the average performance for the level. There are marks in each level.

Before you apply the mark scheme to a student's answer read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1 Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer and not look to pick holes in small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level and then use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 content.

Step 2 Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the Indicative content to reach the highest level of the mark scheme.

An answer which contains nothing of relevance to the question must be awarded no marks.

Question	Marking guidance	Mark	Comments
01.1	by damaging cells/tissues; by producing toxins;	2	Accept examples of damage e.g. interrupting the function of organelles
01.2	 <p>One or both binding sites circled;</p>	1	Accept box or label to indicate one or both binding sites
01.3	<ol style="list-style-type: none"> 1. (During primary response) memory cells produced/stay in circulation; 2. Infection with the same pathogen causes secondary response; 3. More antibodies produced / quicker antibody production; 4. Pathogen killed before symptoms occur; 	3	<ol style="list-style-type: none"> 2. Must have idea of <u>same</u> pathogen, e.g. same/ <i>S. typhi</i>/ <i>reinfection/infected again</i> 3. Must be comparative 4. Allow removed
01.4	<ol style="list-style-type: none"> 1. Antibodies against <i>S. typhi</i> /produced in first infection have complementary shape (binding site)/are specific to antigens on <i>S. typhi</i>; 2. Antigens on <i>S. enteritidis</i> different shape to those on <i>S. typhi</i> so antibodies against <i>S. typhi</i> do not bind/fit/not complementary to antigens on <i>S. enteritidis</i>; 	2	2. Allow different (type) of antigen
01.5	Vaccination;	1	

Question	Marking guidance	Mark	Comments												
02.1	Reverse transcriptase;	1	Allow integrase												
02.2	<table border="1"> <tr> <td></td> <td>CaMV</td> <td>HIV</td> </tr> <tr> <td>Genetic material</td> <td>DNA</td> <td>RNA</td> </tr> <tr> <td>Protein capsid</td> <td>Present</td> <td>Present</td> </tr> <tr> <td>Envelope</td> <td>Absent</td> <td>Present</td> </tr> </table>		CaMV	HIV	Genetic material	DNA	RNA	Protein capsid	Present	Present	Envelope	Absent	Present	1	Reject mRNA
	CaMV	HIV													
Genetic material	DNA	RNA													
Protein capsid	Present	Present													
Envelope	Absent	Present													
02.3	Vector / vector-borne / carrier;	1	Allow horizontal												
02.4	Positive correlation between increased viral load and number of aphids with wings;	1	Allow description e.g. as viral load increases, number of aphids with wings increases Allow converse												
02.5	(As viral load increases oilseed rape plant more likely to die) more aphids with wings so can move to new plant;	1	Allow to find food elsewhere												

Question	Marking guidance	Mark	Comments																
03.1	<p>1 mark for each correct numerical answer ;;; Correct identification of cassava only as risk of kwashiorkor</p> <table border="1" data-bbox="248 443 1155 810"> <thead> <tr> <th data-bbox="248 443 477 612">Crop</th> <th data-bbox="477 443 703 612">Mass of crop needed for 4200 kJ /g</th> <th data-bbox="703 443 929 612">Mass of protein in 4200 kJ of crop / g</th> <th data-bbox="929 443 1155 612">At risk of kwashiorkor? Yes/No</th> </tr> </thead> <tbody> <tr> <td data-bbox="248 612 477 679">Cassava</td> <td data-bbox="477 612 703 679">636</td> <td data-bbox="703 612 929 679">8.9</td> <td data-bbox="929 612 1155 679">Yes</td> </tr> <tr> <td data-bbox="248 679 477 746">Maize</td> <td data-bbox="477 679 703 746">273</td> <td data-bbox="703 679 929 746">24.6</td> <td data-bbox="929 679 1155 746">No</td> </tr> <tr> <td data-bbox="248 746 477 810">Rice</td> <td data-bbox="477 746 703 810">778</td> <td data-bbox="703 746 929 810">21.0</td> <td data-bbox="929 746 1155 810">No</td> </tr> </tbody> </table>	Crop	Mass of crop needed for 4200 kJ /g	Mass of protein in 4200 kJ of crop / g	At risk of kwashiorkor? Yes/No	Cassava	636	8.9	Yes	Maize	273	24.6	No	Rice	778	21.0	No	4	<p>Accept ticks instead of the word Yes. Ignore blanks Whole of risk column must be correct for 1 mark.</p> <p>Allow values within the range: Maize mass of protein 24-25 Rice mass 750-808; mass of protein 19-23</p>
Crop	Mass of crop needed for 4200 kJ /g	Mass of protein in 4200 kJ of crop / g	At risk of kwashiorkor? Yes/No																
Cassava	636	8.9	Yes																
Maize	273	24.6	No																
Rice	778	21.0	No																
03.2	<ol style="list-style-type: none"> 1. Insufficient/less protein in diet means less protein in blood; 2. Water potential of blood (in capillary) too high/ not negative enough; 3. Water (in tissues) not drawn back into capillary by osmosis; 4. (Tissue) fluid/water stays in tissues leading to swelling; 	3	<ol style="list-style-type: none"> 2. Ψ higher than normal/ Ψ of blood should be lower than tissue fluid 3. Reject more tissue fluid made 																
03.3	<ol style="list-style-type: none"> 1. Age on x-axis with full axis titles on both x and y; 2. Correct plotting of values using appropriate scale; 3. No line drawn/ line of best fit drawn; 	3	<ol style="list-style-type: none"> 1. If age on y-axis lose mp1 1. Bar chart can only access mp1 2. Data should cover $\geq \frac{1}{2}$ of y-axis 3. Reject if joined point to point 																

<p>03.4</p>	<p>No: Increased risk at all ages/ not just teenagers; Only 13 shown/ don't know risk for older teens; A risk does not mean it will happen/ can't say they will definitely die from heart attack/ correlation is not causation; May have a heart attack but not die/other forms of CHD not just heart attack; Don't know range of hazard ratios/some could be 1 or less;</p> <p>Yes: All hazard ratios above 1 so suggests higher risk than normal weight; Risk seems to be higher if obese when 13/teenager; Large study so data reliable;</p>	<p>3</p>	<p>For full marks, must score at least one mark for 'No' and at least one mark for 'Yes'.</p>
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Question	Marking guidance	Mark	Comments												
04.1	1. Prevent air bubble being trapped in / blocking <u>xylem</u> ; 2. Would slow/stop water uptake;	2	1. breaks continuous column of water in <u>xylem</u> 2. Ignore transpiration												
04.2	Open the tap on the reservoir to release water and move air bubble to right / on to the ruler scale / back (to start);	1	Open tap alone is not enough Ignore get a longer ruler												
04.3	(More air movement) 1. Water vapour/humid/moist layer next to stomata moved faster; 2. Water potential of air decreased/water potential gradient increased; 3. Water uptake increases;	3	Need idea of more/faster at least once 3. Allow transpiration/ <i>evaporation increases</i>												
04.4	<table border="1" data-bbox="241 900 896 1110"> <thead> <tr> <th data-bbox="241 900 477 999"></th> <th colspan="3" data-bbox="477 900 887 999">Water uptake / mm min⁻¹ when the setting on the fan is</th> </tr> <tr> <th data-bbox="241 999 477 1054"></th> <th data-bbox="477 999 613 1054">Off</th> <th data-bbox="613 999 750 1054">Slow</th> <th data-bbox="750 999 887 1054">Fast</th> </tr> </thead> <tbody> <tr> <td data-bbox="241 1054 477 1110">Group A</td> <td data-bbox="477 1054 613 1110">11</td> <td data-bbox="613 1054 750 1110">18</td> <td data-bbox="750 1054 887 1110">25</td> </tr> </tbody> </table>		Water uptake / mm min ⁻¹ when the setting on the fan is				Off	Slow	Fast	Group A	11	18	25	1	
	Water uptake / mm min ⁻¹ when the setting on the fan is														
	Off	Slow	Fast												
Group A	11	18	25												

<p>04.5</p>	<p>Method</p> <p>1. (At end of experiment remove all leaves and) measure surface area using graph paper /</p> <p>OR</p> <p>1. (At end of experiment) trace leaves onto paper, cut out shapes and weigh. Calculate area by comparing weight with that of known area of paper;</p> <p>2. Divide the transpiration/water uptake rate (in mm min^{-1}) by the surface area (in mm^2);</p> <p><i>More valid comparison because</i></p> <p>3. Takes into account surface area/ some shoots might have more/bigger leaves;</p>	<p>3</p>	<p>2. Allow Calculate rate per unit area if stated how to do it</p>
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Question	Marking guidance					Mark	Comments
05.1		G1	S	G2	Mitosis	2	
	Time / hours	9	8	3	2		
05.2	Protein synthesis; Increase in number of organelles/mitochondria/ribosomes; Growth/increase in size of cell;					2	Allow respiration
05.3	(Stained) so <u>chromosomes/chromatids</u> can be seen; (Squashed) to release cells from root tissue / to provide single layer of cell / to spread cells out;					2	
05.4	1. Count number of cells in field of view in mitosis/ with visible chromosomes AND count total number of cells in field of view; 2. Divide number of cells in mitosis by total number of cells counted;					2	Allow index expressed as a percentage 2. If just formula given then only mp2.
05.5	Cancerous tumours divide more rapidly / have higher mitotic index;					1	Needs to be comparative

Question	Marking guidance	Mark	Comments
06.1	1. Tubes A and B remain cloudy because no lipase/enzyme so no digestion; 2. Tube C is partly cleared as lipase/enzyme digests fat; 3. Tube D is completely clear as bile emulsifies fat/ increases surface area of fat so lipase digests faster;	3	Accept fat or lipid throughout 3 Need idea of what bile does <u>and</u> that it speeds up action of lipase
06.2	1. Bile salts form micelles with fats/lipids/glycerol and fatty acids; 2. (The micelles) release the fats/lipids/ fatty acids into epithelial cells lining the villi of the small intestine;	2	
06.3	Facilitated diffusion / Active transport / co-transport;	1	Ignore diffusion using channel/carrier protein
06.4	1. (some) fatty acids packaged into chylomicrons; 2. enter lacteals / lymphatic system; 3. only drain into bloodstream near heart/not into vein leaving the small intestine;	2	

<p>06.5</p>	<p>Need to identify as negative or positive</p> <p>Negatives:</p> <ol style="list-style-type: none"> 1. Not double-blind trial/may be psychological effect; 2. Few subjects / all women / not clear if different ages / all obese not just overweight / other medical problems/medications; 3. 4 weeks may not be long enough/could be rapid at first then slow down with longer term use; 4. Biased as manufacturers/subjects want to prove it works; 5. No control so diet and exercise might be cause of weight loss / no statistical analysis; 6. May not be optimum/high enough dose <p>Positives:</p> <ol style="list-style-type: none"> 7. Same diet; 8. Same exercise regime; 9. Same dose; 10. Known amount of time; 	<p>4</p>	<p>For full marks, must have at least one positive and at least one negative</p> <ol style="list-style-type: none"> 1. Allow may be placebo effect <p>5.Allow No sd given = no stats analysis.</p> <ol style="list-style-type: none"> 5. No control alone is not enough
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Question	Marking guidance	Mark	Comments
07.1	1. Aorta stretches but recoils to starting length (with increasing mass); 2. (because) aorta has thicker layer of elastic tissue than vena cava; 3. (allows it to) withstand higher pressure at systole and recoil to maintain blood pressure/even out surges;	3	2. Must be clearly comparative 3. Allow pulse/wave of pressure/contraction of left ventricle
07.2	1. Aorta from left ventricle (to body) / pulmonary artery from right ventricle (to lungs); 2. Left ventricle wall is thicker/more muscular so contracts more powerfully/generates more pressure (resulting in higher pressure in aorta);	2	
07.3	1. Walls of veins are thin so can be compressed/squeezed; 2. Large lumen / smooth lining to provide less resistance to flow; 3. Valves prevent back flow;	2	Need structure AND how it aids venous return

Question	Marking guidance	Mark	Comments
08.1	<ol style="list-style-type: none"> 1. Nuclear membrane breaks down (during prophase) allowing the chromosomes more room to move; 2. Spindle fibres form (during prophase/by the start of metaphase); 3. Chromosomes line up in centre of spindle/cell (during metaphase); 4. Attached to spindle fibres by their centromeres; 5. Spindle fibres (shorten/contract and) pull the chromatids apart (during anaphase); 6. Chromatids reach poles and nuclear membrane reforms preventing chromosomes moving away (during telophase); 	5	<p>Must mention both nuclear membrane and spindle for full marks</p> <ol style="list-style-type: none"> 1. Need to indicate <u>purpose</u> of nuclear membrane break down
08.2	<ol style="list-style-type: none"> 1. Mutation / change in DNA base sequence (in genes controlling cell division); 2. (Mutations) arise spontaneously / are random events 3. Mutagens can increase frequency/likelihood of mutation 4. Proto-oncogenes become oncogenes; 5. Oncogenes stimulate rapid cell division without/in absence of a growth factor; 6. Oncogenes cause production of excess growth factor; 7. Tumour-suppressor genes are inactivated (by mutation) so don't inhibit cell division; 	5	<ol style="list-style-type: none"> 3. Allow examples of mutagen 3. Ignore mutagens <u>cause</u> mutation, need idea that they increase frequency of mutation